U.S. Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington 99352

04-WTP-201

Mr. J. P. Henschel, Project Director
Bechtel National, Inc.
2435 Stevens Center
Richland, Washington 99352

Dear Mr. Henschel:

CONTRACT NO. DE-AC27-01RV14136 – APPROVAL OF AUTHORIZATION BASIS AMENDMENT REQUEST (ABAR) 24590-WTP-SE-ENS-04-001, REVISION 1, ELIMINATION OF IMPORTANT TO SAFETY (ITS) MECHANICAL DOOR AND HATCH INTERLOCKS

Reference: BNI letter from J. P. Henschel to R. J. Schepens, ORP, "Transmittal for Approval: Authorization Basis Amendment Request 24590-WTP-SE-ENS-04-001, Revision 1, Elimination of ITS Mechanical Door and Hatch Interlocks," CCN: 093515, dated August 3, 2004.

This letter approves the subject ABAR that Bechtel National, Inc. provided to the U.S. Department of Energy, Office of River Protection (ORP) on August 3, 2004 (Reference). The ABAR proposed to remove ITS mechanical door and hatch interlocks including bogie interlocks, as a control system for facility worker protection from direct radiation, and replace them with locks and administrative controls at the High Level Waste (HLW) facility.

ORP review of the changes proposed in the subject ABAR and of the changes to the Preliminary Safety Analysis Report (PSAR), Revision 1, is summarized in the attached Safety Evaluation Report (SER). Based upon the information in the Reference and the attached SER, the changes are acceptable with minor modification, and there is reasonable assurance that the health and safety of the public, the workers, and the environment will not be adversely affected by those changes, and that they comply with applicable laws, regulations, and River Protection Project Waste Treatment and Immobilization Plant (WTP) contractual requirements.

The proposed changes to the HLW PSAR were reviewed for consistency with the changes to the facility design proposed in the ABAR. The approved proposed changes in this ABAR will ultimately serve to update the PSAR. While the proposed changes to the HLW PSAR, as modified, were determined to be consistent with the proposed changes to the facility design as described in the safety evaluation contained in the ABAR, final review of the proposed changes to the PSAR cannot be made until Chapter 2 of the PSAR is available for review. As a result, this SER provides final approval for the general design changes as described in the ABAR, but only interim approval of the proposed specific changes to the HLW PSAR. Final review and approval of the detailed PSAR changes will be made at the time of PSAR update when revisions to Chapter 2 are provided.

This amendment is effective immediately and shall be fully implemented within 30 days. If you have any questions, please contact me, or your staff may call Walter J. Pasciak, WTP Safety Authorization Basis Team, (509) 373-9189.

Sincerely,

Roy J. Schepens
Manager

WTP: WJP

Attachment

cc w/attach:
M. T. Sautman, DNFSB
J. M. Eller, PAC

Safety Evaluation Report (SER) of Proposed Authorization Basis Amendment Request (ABAR) 24590-WTP-SE-ENS-04-001, Revision 1 of changes to the Safety Envelope Document (SED); High Level Waste (HLW) Facility Specific Information for the River Protection Project Waste Treatment and Immobilization Plant (WTP)

1.0 INTRODUCTION

This SER documents the U.S. Department of Energy, Office of River Protection (ORP) evaluation of changes proposed by Bechtel National, Inc. (the Contractor) involving removal of Important to Safety (ITS) mechanical door and hatch interlocks including gamma monitors and associated penetrations for numerous shielded doors and hatches throughout the HLW facility. In addition, ITS bogie interlocks are being removed.

2.0 BACKGROUND

The WTP authorization basis is the composite of information provided by a Contractor in response to radiological, nuclear, and process safety requirements that is the basis on which ORP grants permission to perform regulated activities. The authorization basis includes that information requested by the Contractor for inclusion in the authorization basis and subsequently accepted by ORP. The Preliminary Safety Evaluation Report (PSAR) describes the analyzed safety basis for those facilities, demonstrates that the facility will perform and be operated such that the radiological, nuclear, and process safety requirements are met, and demonstrates adequate protection of the public, workers, and environment.

The PSAR is based on the preliminary design of the facilities and is part of the authorization basis for WTP construction. ORP authorized construction[1] of the HLW facility based on the facility safety basis documented in the PSAR. Under the requirements of RL/REG-97-13, Revision 10,[2] the Contractor is required to update the PSAR every two years. This amendment request[3] proposes changes to the PSAR that will be incorporated in the PSAR during the next biennial update. This SER documents ORP's evaluation of the facility changes proposed in the reference ABAR, and also evaluates the detailed changes to the PSAR.

3.0 EVALUATION (ACCEPTABLE)

In Revision 1 of the PSAR, mechanical door, hatch, and bogie interlocks, including gamma monitors and associated penetrations, were described as Important to Safety (ITS) because they mitigated the radiological consequences of Design Basis Events (DBE) involving direct radiation. This proposed change will result in use of locks, administrative key control, and implementation of the Radiation Protection Program (RPP) and Radiological Controls Manual

[1] ORP letter from R. J. Schepens to J.P. Henschel, BNI, "Approval of Preliminary Safety Analysis Report (PSAR) Update, Appendix B, Section 3.3," 03-OSR-0450, dated February 2, 2004.
[2] "Office of River Protection Position on Contractor-Initiated Changes to the Authorization Basis," RL/REG-97-13, Revision 10, dated December 2003.
[3] BNI letter from J. P. Henschel to J. R. Schepens, ORP, "Transmittal for Approval: Authorization Basis Amendment Requests 24590-WTP-SE-ENS-04-001, Revision 1, Elimination of ITS Mechanical Door and Hatch Interlocks," CCN: 093515, dated August 3, 2004.

(RADCON Manual) in lieu of interlocks, for many of the shield doors and hatches. The proposed changes to the HLW facility PSAR were determined to be consistent with 10 Code of Federal Regulations (CFR) 835, *Occupational Radiation Protection*, DOE/RL-96-0006, *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for the RPP Waste Treatment Plant Contractor,* and other authorization basis documentation as follows:

10 CFR 835 Subpart F-Entry Control Program, did not specifically require interlocks to control entry into high or very high radiation areas, however, their use could have satisfied the requirements. Section 835.502 "High and very high radiation areas." permits entryways to high and very high radiation areas be locked, provided, during periods of access, positive control over each entry is maintained. In addition, for very high radiation areas, Section 835.502 (c) requires additional measures be implemented to ensure individuals are not able to gain unauthorized or inadvertent access to very high radiation areas. The requirement does not state what the additional measures must be.

The proposed change will replace interlocks with locks and administrative control of the keys to prevent unauthorized or inadvertent entry into high radiation areas and very high radiation areas. The administrative controls specified in the RPP and RADCON Manual will also be implemented. For very high radiation areas, if the shielded personnel access door (SPAD) provides access to very high radiation areas, additional controls like use of a lock-box to safeguard the key to the SPAD lock will be used. Access to the lock-box will require two separate keys, controlled by separate organizational managers in addition to the administrative controls. These controls will also be applied to any crane capable of opening an affected hatch.

Since unauthorized or inadvertent opening of a shield door or hatch could create a direct radiation exposure event only to facility workers, the Contractor is allowed pursuant to Appendix A, Section 5.2 of the Safety Requirements Document Volume II, to use administrative controls to protect the workers. In this situation, the Contractor committed to use the lock and administrative controls described above to establish an isolation boundary around a work area that could become a high or very high radiation area if an adjoining shield door or hatch were opened.

During review of the initial Revision of the ABAR it was not clear if removal of the interlocks would negate the effectiveness of the C5V ventilation system by allowing too many shield doors and hatches to be open at the same time. Revision 1 states in part, "…interlocks associated with the posting ports and interlocks required for the functioning of the C5V (and C3V Canister Storage) system are not being removed," thus clarifying this concern.

3.1 Review of Proposed Changes to HLW PSAR

3.1.1 Proposed Changes to HLW PSAR Section 3.3.5.1, "Direct Radiation":

Section 3.3.5.1 presents a description of the primary control strategies for direct radiation events as a result of entry into radiation areas. The Contractor proposed the section read as follows, with minor modifications made by ORP reviewers as described below (underline indicates new text):

> "Direct radiation events are events in which there is a significant risk that the facility worker is exposed to direct radiation with the potential for an SL-1, SL-2, High, or Moderate consequence. The cause of direct radiation exposure to the facility workers include, but are not limited to, unplanned or inadvertent entry into high or very high radiation areas, planned entry into an area with a high or very high radiation source present, planned entry into an area with a shield door / hatch open providing a direct shine path, introduction of a source into an occupied area, or breach of a shield door, wall, or window.
>
> The primary control strategies for these types of events are to physically lock Shield Doors, Shielded Personnel Access Doors (SPAD), or Hatches. For shield doors and hatches, this may be accomplished by methods such as de-energizing and locking out the bus or locking out manual operators. Further protection is established through a two key access, one of which is controlled by the shift manager. The sections that follow provide additional controls for the described situations."

ORP reviewers removed the phrase "as applicable" from the first sentence of the second paragraph and added the last sentence to the last paragraph. "As applicable" was removed because physical locks are always applicable to the two doors and hatch. The last sentence was added to provide better flow between this section and those that follow.

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. It provides descriptive text regarding control strategies to manage the risk direct radiation exposure to workers from entering high and very high radiation areas. The control strategy of locking doors and hatches is consistent with Safety Requirements Document (SRD) requirements for High consequence events.

3.1.2 Proposed Changes to HLW PSAR Section 3.3.5.1.1, "Unplanned or Inadvertent Entry through SPAD into an Area with Radiological Source Present":

The Contractor proposed this section to be revised as follows with minor modifications made by the ORP reviewers as described below:

> "Worker exposure due to an unplanned or inadvertent entry into an area with a radiological source present has the potential to result in a High consequence to the facility worker. The representative event involves a facility worker inadvertently entering the Cask Handling Tunnel with a canister present.
>
> The selected control for this type of High consequence event is to lock the shielded personnel access door (SPAD) in conjunction with administrative procedures.
>
> - The physical barrier provided by locking the SPADs in conjunction with administrative controls prevents facility workers from unauthorized or inadvertent access to an area with a high radiation source present.

- If the SPAD provides access to very high radiation areas, additional controls like use of a lock-box to safeguard the key to the SPAD lock will be used. Access to the lock-box will require two separate keys, controlled by separate organizational managers in addition to the administrative controls.

During the Integrated Safety Management process, the unmitigated consequence of this accident was determined to be High for the facility worker. The defense in depth requirements for SSCs that prevent or mitigate accidents are delineated in Appendix B of the SRD, 24590-WTP-SRD-ESH-01-001-02. In accordance with these requirements, one ITS barrier is provided. The barrier includes locking the SPAD in conjunction with administrative controls. The locking of the SPADs is a physical design feature barrier, designated as an SS SSC. These controls prevent unauthorized or inadvertent entry into areas when a high radiological source is present. The radiological control program implemented by the RPP, RADCON Manual, and procedures implement the requirements of 10 CFR 835 which will provide additional defense in depth for control of these areas."

In the second paragraph, ORP reviewers changed "this type of safety significant (SS) events" to "this type of High consequence events" because safety significant is a term applied to SSCs, not events. The second bullet describing the additional controls for access to very high radiation areas was added based on the material presented in the safety evaluation report. Also text modifications to the third paragraph were made by ORP reviewers to clarify what Structures, systems, and components (SSC) were designated SS.

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. It provides descriptive text regarding the control strategies to ensure unauthorized or inadvertent do not gain access to high or very high radiation areas through SPAD shield doors.

3.1.3 Proposed Changes to HLW PSAR Section 3.3.5.1.2, "Unplanned or Inadvertent Entry through Vertical or Horizontal Shield Door into an Area with Radiological Source Present":

The Contractor proposed the following new text for this section, with minor modifications made by ORP reviewers as described below:

"Worker exposure due to an unplanned or inadvertent entry into an area with a radiological source present has the potential to result in a High consequence to the facility worker. The representative event involves a facility worker inadvertently entering the Melter Cave Crane Decontamination Area with failed equipment present.

The selected control for this type of High consequence event is to lockout the shield door (e.g. physical lock on electrical bus or drive mechanism) in conjunction with administrative procedures.

- The physical design feature barrier is provided by locking the shield door (e.g. physical lock on electrical bus or drive mechanism) in conjunction with administrative controls prevents facility workers from unauthorized or inadvertent access to an area with a high or very high radiation source present.

During the Integrated Safety Management process, the unmitigated consequence of this accident was determined to be High for the facility worker. The defense in depth requirements for SSCs that prevent or mitigate accidents are delineated in Appendix B of the SRD, 24590-WTP-SRD-ESH-01-001-02. In accordance with these requirements, one ITS barrier is provided. The barrier includes locking the shield door (e.g. physical lock on the electrical bus to prevent operation) in conjunction with administrative controls. The locking of the shield door is a physical design feature barrier, designated as an SS SSC. These controls prevent unauthorized or inadvertent entry into areas when a high radiological source is present. The radiological control program implemented by the RPP, RADCON Manual, and procedures implement the requirements of 10 CFR 835 which will provide additional defense in depth for control of these areas."

In the second paragraph, ORP reviewers changed "this type of safety significant (SS) events" to "this type of High consequence events" because safety significant is a term applied to SSCs, not events. In the first bullet, "physical barrier" has been changed to "physical design feature barrier" because a key lock system is not a physical barrier but a physical design feature barrier. Also text modifications to the third paragraph were made by ORP reviewers to clarify what SSC were designated SS.

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. It provides descriptive text regarding control strategies to manage the risk direct radiation exposure to workers from entering high and very high radiation areas.

3.1.4 Proposed Changes to HLW PSAR Section 3.3.5.1.3, "Planned Entry into an Area with a High or Very High Radiation Source Present":

The Contractor proposed the following new section, with minor modifications made by ORP reviewers as described below:

"Worker exposure due to planned entry into an area with a radiological source present has the potential to result in a High consequence to the facility worker. The representative event involves a facility worker entering the Cask Handling Tunnel with an unlidded cask containing a canister present.

In addition to the control strategy described in Section 3.3.5.1, the selected control for this type of High consequence event is the Radiation Protection Program (RPP).

- The Radiation Protection Program includes work package reviews, radiation work permits, and proper surveys of the area. This administrative control provides radiological surveys/alarming dosimetry in areas with the potential for introduction of

high or very high radiological sources. The Radiation Protection Program also provides evacuation of areas with unacceptable conditions.

During the Integrated Safety Management process, the unmitigated consequence of this accident was determined to be High for the facility worker. The defense in depth requirements for SSCs that prevent or mitigate accidents are delineated in Appendix B of the SRD, 24590-WTP-SRD-ESH-01-001-02. In accordance with these requirements, one ITS barrier is provided. This barrier is SS. The barrier includes surveys prior to entry into areas with transitory sources or potential contamination. This control prevents entry into areas when a high radiological source is present. Additional defense in depth for control of these areas is implemented by the requirements of 10 CFR 835, and in particular, additional physical controls required of 10 CFR 835.502(c). The additional measure required by 10 CFR 835.502(c) will be provided, such as locking out a second electrical disconnect such as a fuse or motor controller, as well as a second lockout on the manual operator (if provided). In lieu of providing a second electrical disconnect, a mechanical blocking device may be used that is capable of holding the door or hatch closed should the electrical lockout be violated and the motor inadvertently energized. This double de-energizing or use of one electrical lockout and a mechanical blocking device could also apply to any crane capable of opening an affected hatch. In addition, the controls will not be established such that personnel would be prevented from rapid evacuation of the area."

In the second paragraph, ORP reviewers changed "this type of safety significant (SS) events" to "this type of High consequence events" because safety significant is a term applied to SSCs, not events. Also, reference to requirements of Section 3.3.5.1 were added for clarity. At the end of the last paragraph ORP reviewers added text from the Contractor's safety evaluation that provides examples of additional measures for meeting the requirements of 10 CFR 835.502(c) and the requirement of 10 CFR 835.502 (d). The new text starts with the phrase "and in particular, additional physical controls required of 10 CFR 835.502(c)."

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. It provides descriptive text regarding control strategies to manage the risk direct radiation exposure presents to workers entering high and very high radiation areas.

3.1.5 Proposed Changes to HLW PSAR Section 3.3.5.1.4, "Planned Entry into an Area with a Shield Door/Hatch Open Providing a Direct Shine Path":

The Contractor proposed the following new text for this section, with minor modifications made by ORP reviewers as described below:

"Worker exposure due to planned entry into an area with a shield door / hatch open providing a direct shine path has the potential to result in a High consequence to the facility worker. The representative event involves a facility worker entering the Cask Handling Tunnel with a canister being lowered into the cask from the Canister Decon Cave.

The selected control for this type of High consequence event is an isolation boundary around the work area.

- The lock and administrative control program establishes an isolation boundary around the work area prior to entry. This control provides a lock and administrative controls (e.g. locks on SPADS and locks on the electrical bus or drive mechanism for shield doors / hatches) that implement pre-entry isolation requirements on shield doors/ hatches that make up the isolation boundary.

During the Integrated Safety Management process, the unmitigated consequence of this accident was determined to be High for the facility worker. The defense in depth requirements for SSCs that prevent or mitigate accidents are delineated in Appendix B of the SRD, 24590-WTP-SRD-ESH-01-001-02. In accordance with these requirements, one ITS barrier is provided. This barrier is SS. The barrier includes lock and administrative control program establishes an isolation boundary around the work area prior to entry. This control prevents shield doors or hatches from being open (providing a direct shine path) to the area that is being entered. The radiological control program implemented by the RPP, RADCON Manual, and procedures implement the requirements of 10 CFR 835, and in particular, additional physical controls required of 10 CFR 835.502(c). The additional measure required by 10 CFR 835.502(c) will be provided, such as locking out a second electrical disconnect such as a fuse or motor controller, as well as a second lockout on the manual operator (if provided). In lieu of providing a second electrical disconnect, a mechanical blocking device may be used that is capable of holding the door or hatch closed should the electrical lockout be violated and the motor inadvertently energized. This double de-energizing or use of one electrical lockout and a mechanical blocking device could also apply to any crane capable of opening an affected hatch."

In the second paragraph, ORP reviewers changed "this type of safety significant (SS) events" to "this type of High consequence events" because safety significant is a term applied to SSCs, not events. At the end of the last paragraph ORP reviewers added text from the Contractor's safety evaluation that provides examples of additional measures for meeting the requirements of 10 CFR 835.502(c). The new text starts with the phrase "and in particular, additional physical controls required of 10 CFR 835.502(c)."

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. It provides descriptive text regarding control strategies to manage the risk direct radiation exposure to workers from entering high and very high radiation areas.

3.1.6 Proposed Changes to HLW PSAR Section 3.3.5.1.5, "Introduction of Radiological Source into Occupied Areas":

The Contractor proposed this section to be changed as follows, with minor modifications made by ORP reviewers as described below:

"Worker exposure due to a radiological source introduced into an occupied area has the potential to result in a High consequence to the facility worker. The representative event involves the Canister Storage Cave Export Hatch opening or a canister contained in an unlidded cask while personnel are present in the Cask Handling Tunnel. The Canister Storage Cave full of product canisters or a crane lowering a canister into the Cask Handling Tunnel results in a direct radiation exposure to the facility worker.

The selected controls for these types of events are an isolation boundary around the work area.

- The lock and administrative control program establishes an isolation boundary around the work area prior to entry. This control provides a lock and administrative controls (e.g. locks on SPADS and locks on the electrical bus or drive mechanism for shield doors / hatches) that implement pre-entry isolation requirements on shield doors/ hatches that make up the isolation boundary.

  During the Integrated Safety Management process, the unmitigated consequence of this accident was determined to be High for the facility worker. The defense in depth requirements for SSCs that prevent or mitigate accidents are delineated in Appendix B of the SRD, 24590-WTP-SRD-ESH-01-001-02. In accordance with these requirements, one ITS barrier is provided. The barrier includes lock and administrative control program establishes an isolation boundary around the work area prior to entry. The locking of the shield door or hatches is a physical design feature barrier, designated as an SS SSC. This control prevents shield doors or hatches from being open (providing a direct shine path) to the area that is being entered. The radiological control program implemented by the RPP, RADCON Manual, and procedures implement the requirements of 10 CFR 835 which will provide additional defense in depth for control of these areas."

In the last paragraph, modifications were made by ORP reviewers to clarify what SSCs were designated SS.

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. It provides descriptive text regarding control strategies to manage the risk direct radiation exposure to workers from entering high and very high radiation areas.

3.1.7 Proposed Changes to HLW PSAR Section 3.3.5.1.6, "Transport of Improperly Lidded Canister Cask"

The Contractor proposed this section to be changed as follows with modifications made by the ORP reviewers:

"Worker exposure due to a loaded canister cask without the canister cask lid in place has the potential to result in a High consequence to the facility worker. The representative event involves a loaded canister cask moving from the Cask Lid Lifting machine in the Cask Handling Tunnel (H-B033B) into the Loading Area without a canister cask lid. Transporting an unlidded and loaded canister cask into the Loading Area results in direct

radiation exposure to the facility worker. Causes for transporting a loaded canister cask without a canister cask lid into the Loading Area include, but are not limited to, failure of the cask lidding equipment or operator error.

The selected controls for these types of events are appropriate shielding design and items located in appropriately shielded areas, and gamma interlocks on port/hatch.

- The shielding will be appropriately designed and items will be located in appropriately shielded areas.
- The port/hatch will be interlocked with the area gamma monitor.

During the Integrated Safety Management process, the unmitigated consequence of this accident was determined to be High for the facility worker. The defense in depth requirements for SSCs that prevent or mitigate accidents are delineated in Appendix B of the SRD, 24590-WTP-SRD-ESH-01-001-02. In accordance with these requirements, one ITS barrier is provided. This barrier is the SS gamma monitor interlocks for the port/hatch and another is the location of items in appropriately shielded areas. The gamma monitors in the Cask Handling Tunnel are interlocked with the Cask Export Hatch to prevent operation of the hatch at a high radiation setpoint. The hatch is appropriately shielded to prevent a direct radiation exposure to the facility worker if the cask is unlidded. The radiological control program implemented by the RPP, RADCON Manual, and procedures implement the requirements of 10 CFR 835, which will provide additional defense in depth for control of these areas. In addition, cameras will be used to verify the canister cask lid is in place prior to removal of the cask from the lidding station."

In the last sentence of the third paragraph, the Contractor proposed cameras "may" be used to visually confirm the cask lid is in place prior to movement of the cask. The ORP changed "may" to "will" to clearly indicate implementation of the defense in depth philosophy.

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. This section was changed to delete reference to gamma interlocks associated with the canister cask bogie interlock system. Deletion of the bogie interlock system is acceptable since the passive shield wall and export hatch provide adequate shielding to protect the facility worker from direct radiation resulting from an unlidded cask, provided the cask export hatch is not opened. Maintaining gamma interlock on the hatch meets the requirement expressed in 10 CFR 835.502 (b) by functioning automatically to prevent introduction of a radiation source or field into an area when individuals may be present. Implementation of administrative controls, including use of cameras to visually verify the cask lid is in place prior to movement, provides addition defense in depth.

3.1.8 Proposed Changes to HLW PSAR Section 3.5.1.6.1 "Transport of Improperly Lidded Drum Cask"

The Contractor proposed this section to be changed as follows with minor modifications made by the ORP reviewers as described below:

"Worker exposure due to a loaded drum cask without the drum cask lid in place has the potential to result in a High consequence to the facility worker. This event is similar to the above event that involves an improperly lidded canister cask. The drum cask lid is improperly positioned or missing on the drum cask in the Cask Transfer Tunnel (H-B028A). Transporting an unlidded and loaded drum cask into the Cask Import/Export area or entering into the Cask Transfer Tunnel results in direct radiation exposure to the facility worker.

The selected controls for this type of High consequence event are gamma interlock on the Cask Import/Export Shield Door, and an interlock between the Cask Import/Export Shield Door and the Cask Transfer Hatch.

- The Cask Import/Export Shield Door is interlocked to the gamma monitor in the Cask Transfer Tunnel.
- The Cask Import/Export Shield Door is interlocked to the Cask Transfer Hatch.

During the Integrated Safety Management process, the unmitigated consequence of this accident was determined to be High for the facility worker. The defense in depth requirements for SSCs that prevent or mitigate accidents are delineated in Appendix B of the SRD, 24590-WTP-SRD-ESH-01-001-02. In accordance with these requirements, one ITS barrier is provided. This barrier is provided by a gamma interlocked Cask Import/Export Shield Door and an interlock between the Cask Import/Export Shield Door and the Cask Transfer Hatch. The radiological control program implemented by the RPP, RADCON Manual, and procedures implement the requirements of 10 CFR 835 which will provide additional defense in depth for control of these areas. In addition, cameras will be used to verify the canister cask lid is in place prior to removal of the cask from the lidding station."

In the second paragraph, ORP reviewers changed "this type of safety significant (SS) events" to "this type of High consequence events" because safety significant is a term applied to SSCs, not events. In the last sentence of the third paragraph, the Contractor proposed cameras "may" be used to visually confirm the cask lid is in place prior to movement of the cask. The ORP changed "may" to "will" to clearly indicate implementation of the defense in depth philosophy.

Evaluation (acceptable, as modified): This change is consistent with the proposed design change evaluated in Section 3.0 above. This section was changed to delete reference to gamma interlocks associated with the canister cask bogie interlock system described above in 3.1.7. Deletion of the bogie interlock system is acceptable since the passive shield wall and export hatch provide adequate shielding to protect the facility worker from direct radiation resulting from an unlidded cask, provided the cask import/export shield door or transfer hatch is not opened. Maintaining gamma interlock on the hatch meets the requirement expressed in 10 CFR 835.502 (b) by functioning automatically to prevent introduction of a radiation source or field into an area when individuals may be present. Implementation of administrative controls, including use of cameras to visually verify the cask lid is in place, provides addition defense in depth.

3.1.9 Proposed Changes to HLW PSAR Section 3.4.1.6.1.8, "Conclusions"

The Contractor proposed the following change to the last paragraph of this section with modifications made by the ORP reviewers as described below:

> "The ITS controls are hoisting equipment and C5 ventilation system. The defense in depth protections are limits on operating heights, interlocks, and established isolation boundaries around work areas (lock and administrative controls program for hatches, shield doors, or personal access doors)."

ORP reviewers restored "interlocks" to the second sentence of the proposed change since the Contractor's Safety Evaluation stated that interlocks associated with posting ports and functioning of the C5V system are not being removed.

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. It provides descriptive text regarding control strategies to manage the risk from a drop of a filled wastebasket from the Melter cave to the drum transfer tunnel floor.

3.1.10 Proposed Changes to HLW PSAR Section 3.4.1.6.3.1, "Accident Scenario"

The Contractor proposed deletion of the reference to monitoring the cask for gamma radiation after the lid had been affixed at the lidding station and involves the deletion of specific the gamma monitor at the lidding station to support the bogie interlock. Gamma detection equipment for the shield door/cask export hatch interlock will remain and will prevent movement of an unlidded cask outside of the shielded enclosure.

> "To export the lidded 55 gal drum, the Cask Transfer Hatch is opened, the drum is lowered by the hoist in the Swabbing and Monitoring Area into a Solid Waste Cask in the Cask Transfer Tunnel, and the Cask Transfer Hatch is closed. Next, the Cask Transfer Bogie is positioned at the lidding station where the cask lid is placed on the cask. After this verification, the shield door is opened, the bogie is moved from the Cask Transfer Tunnel into the Cask Import/Export Area, and the shield door is closed. At this stage, operators enter the Cask Import/Export Area and bolt the lid onto the cask. If needed, the cask is swabbed and decontaminated. Next, the cask is lifted by the monorail hoist in the Cask Import/Export Area. The maximum drop height for an accidental drop during this operation is 14 ft, see item 27 in Attachment 1 of CCN 042273 *Revised HLW Product Canister and Waste Drum Drop heights, Revision 2*. The cask is placed on Cask Transport Vehicle and this vehicle is wheeled to the Export Truck Bay. Here the cask is lifted by the truck bay crane to the maximum lift height of 30-ft (item 7 in Table 1). Then an accidental failure allows the cask to drop to the Truck Export Bay Floor. This drop is identified as a DBE in 24590-WTP-RPT-TE-01-002. It represents most severe consequences for accidental cask drops in potentially occupied areas. Truck Export Bay is C1 ventilated. Due to the presence of operators in this area, the Solid Waste Cask must withstand this drop and prevent glass particulate from being released in an aerosol form."

Evaluation (acceptable): The change is consistent with the proposed design change evaluated in Section 3.0 above. Deletion of specific the gamma monitor at the lidding station to support the bogie interlock is consistent with the Contractor's safety evaluation. Gamma detection equipment for the shield door/cask export hatch interlock will prevent movement of an unlidded cask outside of the shielded enclosure.

3.1.11 Proposed Changes to HLW PSAR Table 3A-24, "HLW Controls Based on Facility Worker Safety":

The Contractor proposes to add the following text to this table and delete reference to Cask Transfer Bogie interlock:

"The lock and administrative controls program establishes an isolation boundary around the work area prior to entry. (SCR-HSTR/N0013 and SCR-HADM/N0006)	Reduces facility worker exposure.
Lock on controls associated with shield door and administrative controls prevent access or unauthorized or inadvertent entry through shield door to prevent high radiation exposure to facility workers. (SCR-HSTR/N0014 and SCR-HADM/N0006)	Reduces facility worker exposure.
Lock on Shield Personnel Access Door (SPAD) and administrative controls prevent access or unauthorized or inadvertent entry through SPAD to prevent high radiation exposure to facility workers. (SCR-HSTR/N0008 and SCR-HADM/N0006)"	Reduces facility worker exposure.
"Shield Door Gamma Interlock system prevents personnel access. (SCR-HINST/N0005)"	Prevents personnel access into high radiation areas where mechanical locks and administrative controls may not be used.

Evaluation (acceptable): The change is consistent with the proposed design change evaluated in Sections 3.0, 3.1.1, 3.1.2, and 3.1.3 above. It provides descriptive text regarding control strategies to manage the risk from direct radiation exposure presents to workers from entering high or very high radiation areas.

3.1.12 Proposed Changes to HLW PSAR Section 4.3.11, "Mechanical Interlocks," including Subsections 4.3.11.1 through 4.3.11.6:

The Contractor proposed this section be revised as follows with minor modifications made by the ORP reviewers as described below:

> **"4.3.11 Mechanical Interlocks**
> The SDC mechanical interlocks prevent multiple shield doors/hatches from opening that could expose facility workers to high radiation sources. These interlocks will be designed, constructed, and installed to the same standards and codes. Therefore, they are collectively discussed below.

4.3.11.1 Credited Safety Function

Gamma Detector Interlock for the Shield Doors, Shielded Hatches, and Posting Boxes
Gamma detection systems are placed to interlock the actuation mechanisms for doors/hatches to stay closed to prevent exposure of the operator to excessive radiation.

Shield Doors, SPADs, Shielded Hatch, and/or Posting Boxes Interlocks and Locks
The safety function of the interlocks associated with the shield doors and shielded hatches, and locks associated with shield doors, SPADs, and shielded hatches is to prevent multiple shield barriers from opening simultaneously thus preventing unplanned exposures that may result in consequences to the facility worker not allowed by the radiation exposure standards in the SRD.

4.3.11.2 System Description

The interlocks are designed to control inadvertent exposure of the facility worker from high radiation sources.

Gamma Detector Interlock for the Shield Doors, Shielded Hatches, and Posting Boxes
All SPADs, Shield Doors, and Hatches that allow access to areas with potentially high radiation sources are locked (shield doors and hatches may be locked by locking out their controls). There is also an isolation boundary around work areas, including physical locks (shield doors and hatches may be locked by locking out their controls),) so that a facility worker cannot open a shield door to an adjoining area while a high radiation source is present in that area.

Shield Doors, Shielded Hatch Interlock, and/or Posting Boxes
The shield barrier interlock system allows the actuation mechanisms of secondary shield doors/hatches to open only if personnel have not opened the primary shield door. For example, the shield door/hatch on the hot side of the process is interlocked with the shield door/hatch at the cold side so that if one of these doors is open, the actuation mechanisms for the other door/hatch are interlocked to stay in the closed position. The interlock is used in conjunction with proximity switches (SDC) to determine the disposition of the shield door (open or closed).

4.3.11.3 Functional Requirements

The gamma detector and shielded hatch, shield door, and SPAD locks and administrative controls will prevent access to areas with high radiation sources, each with a reliability of 5×10^{-3}/yr.

The SPAD/shield door/shielded hatch locks and administrative controls are required to prevent inadvertently opening of a secondary shield door or shielded hatch, as applicable, after personnel have entered through the primary shield door into an area where opening of the secondary shield door or hatch could introduce a high radiation source.

The interlocks will be SC-III and designed to meet SRD Safety Criteria 1.0-5, 3.2-1, 4.1-2, 4.1-4, 4.3-4, 4.3-5, 4.4-1, 4.4-2, 4.4-3, and 4.4-4. SDC SSCs will meet QL-1 requirements.

4.3.11.4 Standards

The following interlocks and proximity switches will be designed and constructed in accordance with ISA S84.01, IEEE 338, IEEE 344, IEEE 379, IEEE 384, and IEEE 1023.

- Gamma detector interlocked with the shield door, or shielded hatch
- Positional interlocks and proximity switches with shield doors/shielded hatches to prevent multiple shield barriers from opening
- The effects of aging on normal and abnormal functioning will be considered in the design and qualification of the ITS electrical equipment in accordance with IEEE 323.

4.3.11.5 System Evaluation

The design of the SDC gamma and positional interlocks will prevent multiple shield doors/hatches from opening simultaneously, creating a shine path from the source to the operator.

ISA S84.01 is applied for all automatically executed safety instrumented systems to provide the guidance to ensure the required reliability of these systems (~5.0×10^{-3}/yr). A tailored version of IEEE 338 supplements ISA S84.01 in designing safety-instrumented systems so they can be tested to prove that they adequately perform their required safety functions. A tailored version of IEEE 344 is applied to those safety-instrumented systems required to function during and (or) after a seismic event. A tailored version of IEEE 379 supplements ISA S84.01 in design considerations for safety instrumented systems, ensuring that theses systems meet the single-failure criterion. A tailored version of IEEE 384 supplements ISA S84.01 in design considerations for independence of multiple-channel safety systems. Finally, a tailored version of IEEE 1023 is applied to all safety functions requiring indication and/or alarm at a safety qualified operator interface.

4.3.11.6 Controls (TSRs)

Each interlock/lock will prevent personnel exposure. Therefore, a specific TSR will be developed for each interlock specifying surveillance and testing requirements. The interlocks necessary to ensure the prevention of personnel access and prevention of unplanned exposures are discussed in section 5.5.8."

ORP reviewers corrected PSAD to SPAD throughout this section. In the third paragraph, the reviewers inserted "not" to make clear failure to use the control systems could result in exposure to the workers in excess of the radiation exposure standards in the SRD. In the first sentence of the third paragraph "accessed" was changed to opened for clarity.

Evaluation (acceptable): The change is consistent with the proposed design change evaluated in Sections 3.0, 3.1.1, 3.1.2, and 3.1.3 above. It provides descriptive text regarding control strategies to manage the risk direct radiation exposure presents to workers from high or very high radiation areas.

3.1.13 Proposed Changes to HLW PSAR Section 4.4.12, "Bogie Interlocks," and its subsections:

The Contractor proposes to delete this section which addresses bogie interlocks.

Evaluation (acceptable): Deletion is consistent with the proposed change evaluated in Section 3.0 above.

3.1.14 Proposed Changes to HLW PSAR Table 4A-2, "Important to Safety: Description and Basis for Safety Design Significant Structures, Systems, and Components":

The Contractor proposes to delete the discussion of Bogie Interlocks and include the following:

Table 4A-2 Important to Safety: Description and Basis for Safety Significant Structures, Systems, and Components

SS System (Major components)	**Safety Function**	**Functional Requirements /Standards (Chapter 4)**	**Basis for ITS Designation (Chapter 3)**
Lock with Administrative Controls on SPAD's	Prevent access or unauthorized or inadvertent entry through SPAD to prevent high radiation exposure to facility workers	Section 4.3.11	Section 3.3.5.1, Table 3A-24
Lock with Administrative Controls Associated with Shield Door Controls	Prevent access or unauthorized or inadvertent entry through shield door to prevent high radiation exposure to facility workers	Section 4.3.11	Section 3.3.5.1, Table 3A-24
Lock and Administrative Controls Provide Isolation Boundary Around Work Area	Prevent inadvertent introduction of a radiation source into the work area	Section 4.3.11	Sections 3.3.5.1, Table 3A-24

Evaluation (acceptable): The change is consistent with the proposed design change evaluated in Section 3.0 above. It identified the safety classification (Safety Significant) of major components used to minimize the risk of a direct radiation event to facility workers.

3.1.15 Proposed Changes to HLW PSAR Section 5.5.8, "Limiting Conditions for Operation - Mechanical (Shield Door) Interlock Operability":

The Contractor proposes to delete reference to personnel shielded access door interlocks and make clear the limiting condition for operation apply to shield doors and hatches.

> "Purpose**:** This control, based on facility worker safety, ensures the mechanical interlocks' operability. The interlocks prevent unacceptable exposures to high radiation sources. Without controls, facility workers could be exposed to high radiation, resulting in exposures to the facility worker above the Radiological Exposure Standards (RES). Several types of mechanical interlocks are credited:

- Gamma detection interlocking with shield doors/hatches
- Shield doors interlocked with shielded hatches

A failure of one of these control results in exposure to the facility worker above the RES.

The TSR operability requirements for mechanical interlocks include the following elements:

- Shield door interlocks with shielded hatches shall be operable.
- The gamma detection instrumentation shall be operable.
- The position instrumentation on the hatch shall be operable.
- The door actuation equipment for the hatch shall be operable to prevent the hatch from opening when a gamma source is present.

If the mechanical interlocks fail, facility workers could be exposed to unacceptable levels of radiation. The above controls actively prevent the shield doors/hatches from opening when facility workers are in the vicinity.

Surveillances related to this LCO include the following elements:

- Periodic verification that the shield door actuation equipment is operable
- Periodic source checks of the gamma detection instrumentation
- Periodic functional tests of the gamma detector hatch interlock
- Periodic verification that the hatch door actuation equipment is operable

These controls apply to the HLW facility in the operation and standby modes.

Derivation Criteria: This control was selected to prevent unacceptable radiological exposures to the facility worker."

Evaluation (acceptable, as modified): The change is consistent with the proposed design change evaluated in Section 3.0 above. The change deletes reference to SPADs and describes the LCO and TSR applied to interlocks remaining on shield doors and hatches.

3.1.16 Proposed Change to HLW PSAR Section 5.5.10, "Limiting Condition for Operation Bogie Interlocks Operability":

The Contractor proposed to delete this section.

Evaluation (acceptable): The change is consistent with the proposed change evaluated in Section 3.0 above. The gamma monitor with shield door/hatch interlocks and the lock and administrative controls will provide an equivalent level of facility worker safety.

3.1.17 Proposed Change to HLW PSAR Table 5A-1, "Hazard and Accident Analysis and Technical Safety Requirement Cross Reference":

The Contractor proposes to modify the table as follows with modification made by the ORP reviewers as described below:

Table -1 Hazard and Accident Analysis and Technical Safety Requirement (TSR) Cross Reference

Chapter 3 Section	TSR	Control Basis
HLW Controls Based on Facility Worker Safety Table 3A-24	LCO, Mechanical (shield door and gamma shield door) Interlock Operability 5.5.8, Administrative Controls - Personnel Access 5.5.14.4, Administrative Controls - Radiological Protection Program 5.5.15.5	This LCO provides controls to protect the facility worker from exposure above the RES.

AC = Administrative Control
LCO = Limiting Condition for Operation

During the review ORP reviewers identified other TSRs that should be included in this table. As a result, the Contractor proposed TSRs to be added to the table and appear above as underlined.

Evaluation (acceptable): The suggested change is acceptable because it identifies TSRs that will provide confidence that mechanical locks and administrative controls will ensure individuals are not able to gain unauthorized or inadvertent access to high and very high radiation areas. It also provides that entry into high and very high radiation areas will be controlled so that the potential for direct radiation dose in excess of the RES will be minimized.

4.0 CONCLUSION

On the basis of the considerations described above, ORP has concluded there is reasonable assurance that the health and safety of the public, the workers and the environment will not be adversely affected by the changes proposed by ABAR 24590-WTP-SE-ENS-04-001, Revision 1. The proposed changes do not constitute a significant reduction in commitment or effectiveness relative to the design, construction, and operation of building important to safety structures, systems, and components. Accordingly, the proposed changes, as modified, are acceptable and ORP approves the proposed HLW PSAR changes as proposed in 24590-WTP-SE-ENS-04-001, Revision 1.